Simultaneous, label-free, multispectral fluorescence lifetime imaging and optical coherence tomography using a double-clad fiber.

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Public Summary:
We present a novel fiber-based imaging platform that allows simultaneous fluorescence lifetime imaging (FLIm) and optical coherence tomography (OCT) using a double-clad fiber. This platform acquires co-registered images showing structural and compositional contrast in unlabeled biological samples by scanning the fiber tip across the sample surface. We report a characterization of each modality and show examples of co-registered FLIm and OCT images acquired from a lemon segment and a section of human coronary artery. These biological tissues served as proof-of-concept of this new bi-modal imaging technique. The close comparison between the combined FLIm and OCT images and a co-registered histology section demonstrated the potential of this technique for minimally invasive, multimodal imaging of tissue structure and composition and its suitability for analysis of various biological tissues including engineered tissues.

Scientific Abstract:
We present a novel fiber-based imaging platform that allows simultaneous fluorescence lifetime imaging (FLIm) and optical coherence tomography (OCT) using a double-clad fiber. This platform acquires co-registered images showing structural and compositional contrast in unlabeled biological samples by scanning the fiber tip across the sample surface. In this Letter, we report a characterization of each modality and show examples of co-registered FLIm and OCT images acquired from a lemon segment and a section of human coronary artery. The close comparison between the combined FLIm and OCT images and a co-registered histology section provides a qualitative validation of the technique and highlights its potential for minimally invasive, multimodal imaging of tissue structure and composition.